SECTION

II

Regulatory Programs

Preface

Section I provided an overview of statutory authority and management objectives of the Arizona Department of Water Resources (Department), and described the physical, climatic, and demographic characteristics of the active management area (AMA), as well as the water use characteristics. Those descriptions of long-term water level declines, land subsidence, and water quality problems, coupled with current and projected groundwater over-drafting, provide compelling justification for the development of progressive and responsible water management programs.

This section of the Third Management Plan is entitled "Regulatory Programs" because the programs described are required of groundwater users or are preconditions to obtaining certain permits or technical and financial assistance. The regulatory chapters that follow describe specific requirements for groundwater users within the AMA. Programs contained in this section are a combination of mandatory conservation requirements, additional incentives designed to encourage the use of renewable water sources, recharge program eligibility and operational criteria, criteria for obtaining technical and financial assistance for water management programs, and plan implementation activities, including the Department's compliance and enforcement program.

Chapters 4, 5, and 6 contain the agricultural, municipal, and industrial conservation programs respectively. Chapter 7 discusses the Department's groundwater quality management program and provides an assessment of water quality within the AMA. Chapter 8 describes the Department's augmentation and recharge program, and Chapter 9 discusses the Department's water management assistance program. Finally, Chapter 10 outlines the Department's policies and procedures for implementation of the plan.

The regulatory program is based on a philosophy developed by the Department over the course of the last two management periods. In the first management period, the Department focused on the conservation of groundwater as its primary management goal. In the second management period, the Department continued its goal of groundwater conservation but also began to develop a program for the augmentation of water supplies, which included incentives for the increased use of renewable supplies. In the third management period, the Department's focus is both on conservation of groundwater and augmentation of water supplies. The Department's regulatory philosophy is based upon its overall water management goals for the management plans: the conservation of groundwater through the efficient use of all water sources and the augmentation of water supplies. The fundamental precepts of this philosophy are:

- **The Pinal AMA Management Goal**

  For three of the AMAs, Prescott, Tucson, and Phoenix, the management goal is to achieve safe-yield by 2025 or earlier, and the goal for the Santa Cruz AMA is to maintain safe-yield and prevent long-term declines in local water levels. In the Pinal AMA where a predominately agricultural economy exists, the goal is to allow the development of non-irrigation water uses, extend the life of the agricultural economy as long as feasible, and preserve water supplies for future non-irrigation uses. The goal for the Pinal AMA is often referred to as "planned depletion." The Groundwater Code (Code) does not specify the quantity of water that must be preserved for non-irrigation uses, nor does it list any criteria by which to determine how long agricultural economies should be preserved.

  Although agriculture is, by far, the largest water user in the Pinal AMA and will continue to be so well into the foreseeable future, municipal and industrial water uses are increasing throughout the AMA. The only way to ensure the availability of a water supply for future non-irrigation uses is to preserve a portion of the AMA's groundwater supplies. For the second management period (1990-

2000), the Department, at the request of the Pinal AMA Groundwater Users Advisory Council (GUAC), interpreted the AMA's management goal to be the preservation of groundwater supplies between 1,000 and 1,200 feet below land surface for future non-irrigation uses. The amount of groundwater in storage between these depths in the AMA's aquifers was estimated to represent enough water to supply a population of about 200,000 for 200 years.

The Department's analysis found that even in those areas of the Pinal AMA with the worst groundwater overdraft and highest decline rates, the agricultural economies should not be negatively affected by any regulations that would be implemented to meet this goal. Economic factors instead would likely discourage agricultural pumpage. At depths of greater than 1,000 feet, groundwater pumping, in all likelihood, would not be economically feasible for irrigation purposes. The 1,000 foot limit, therefore, allows agriculture to continue to use groundwater for as long as it is likely to be economically feasible.

While the Department's interpretation of the Pinal AMA's goal for the second management period was beneficial in providing greater certainty to water users, developers, and others concerned about the availability of future water supplies, the goal for the use of groundwater supplies to 1,000 feet below land surface remained unquantified. For the third management period (2000-2010), the Department has decided that, in addition to continuing to preserve groundwater supplies between 1,000 and 1,200 feet for future non-irrigation uses, it will quantify the goal for the use of groundwater supplies to 1,000 feet in the AMA's two principal subbasins. Recent hydrologic studies by the Department show that, excluding long-term storage credits that have been accrued through various recharge projects, the amount of recoverable groundwater in storage to 1,000 feet in the Eloy and Maricopa-Stanfield subbasins is slightly greater than 31 million acre-feet. The Department, in consultation with the GUAC, has decided to ensure the availability of these groundwater supplies for all water users for at least 100 years. Consequently, the average rate of groundwater depletion in the two subbasins is calculated to be 310,000 acre-feet per year based upon the current estimate for the amount of groundwater in storage.

To account for differences in annual rates of depletion, the Department will establish a groundwater storage account. In those years when groundwater is depleted at a rate less than the "planned depletion allowance" (PDA) of 310,000 acre-feet per year, the Department will credit the difference toward future use, and in those years when groundwater is depleted at a rate greater than the PDA, the difference will be debited. In order to maintain an accurate groundwater storage account, the Department will need to develop and implement an extensive, long-term groundwater monitoring program in the two subbasins. This monitoring program will also enable the Department to further assess the amount of groundwater in storage. If the current storage estimate is found to be inaccurate, the PDA will be modified accordingly.

It is important to note that, in addition to the PDA, water users can pump those groundwater supplies that are naturally or artificially recharged on an annual basis. These supplies include net groundwater inflow into the AMA's aquifers and incidental recharge of the aquifers, resulting mostly from percolation of water from agricultural irrigation and canal seepage.

- **Total Water Use Conservation Requirements and "Stacking"**

With the wide array of water resources available in Arizona as an alternative to groundwater, including surface water, effluent, CAP, and poor quality remediation water, the Department believes that the best management plan will promote use of these alternative supplies whenever and wherever possible. At the same time, the Department recognizes that groundwater is often a very accessible and inexpensive source of supply, whereas the alternative sources can be expensive

and difficult to use. The Department also recognizes that groundwater is the state's "emergency" supply, and it must be available for use whenever the other alternatives run short.

For these reasons, the Department believes that it is both impractical and unwise to consider groundwater use as the only measure of regulatory compliance. The level of groundwater use that is reasonable is relative to the amount of water used from other sources. The Department has developed a regulatory strategy of evaluating the total water use of each individual user and provider and setting conservation requirements based upon that total water use. This strategy ensures that groundwater users make reasonable use of groundwater and encourages innovation and flexibility in the use of alternative supplies. However, in keeping with the statutory obligations and limitations, conservation requirements apply only if groundwater is used.

The regulatory program of the Department is therefore structured around the concept of "stacking" different types of water, by type, in a compliance hierarchy, with groundwater on top. If a total water use conservation requirement is exceeded by a user of groundwater, the amount of the violation of that requirement will be measured by the amount of groundwater used in excess of the regulatory requirements. This strategy will ensure that if groundwater is being used, it is being used as wisely and efficiently as economically possible. This system also provides the flexibility needed by most users of commingled supplies, allowing groundwater to be used as needed to supplement alternative sources.

- **Flexibility in the Components of the Regulatory Plan**

The Department recognizes that water use varies by year and locality. Therefore, the Department exercises maximum flexibility in dealing with water users under the management plan. For example, most of Department's conservation programs include a basic program, with one or more alternative programs designed to meet special circumstances. The basic program is generally designed to place simple numerical limits on water use, leaving the means of achieving those limits wholly up to the water user or provider. The alternative programs tend to remove numerical limits in favor of specific conservation measures more suitable to the water user.

Another component of regulatory flexibility is the establishment of "flexibility accounts" for most allotment-based requirements. These accounts generally allow water users to borrow or bank water from one year to the next in order to overcome the variation in use caused by weather or other unforseen circumstances. Flexibility accounts are mandated by statute for agricultural users, and the Department has used this example to incorporate flexibility accounting into municipal and industrial programs as well.

- **Administrative Review and Variance of Conservation Requirements**

Even with the general flexibility of the regulatory programs, the Code recognizes that certain individual conservation requirements may pose hardship in certain circumstances. To allow relief in these situations, the Code provides for an administrative review and variance process. The emphasis in this process is on the impact of a particular conservation requirement as it is applied to an individual water user. Administrative review and variance are fact-intensive inquiries that may result in some regulatory relief and are considered on a case-by-case basis.

- **Measuring, Reporting, and Auditing Water Use**

Once a user is properly notified of the Department's conservation requirements, the use of water must be measured and reported by the user. This information is then reviewed and occasionally audited by the Department to determine compliance with requirements. This ensures that all users

are treated equally and that each user is treated fairly. It is the Department's position that good measurement, reporting, and auditing have the substantial side benefit of increasing user awareness of exact water use. This information is also invaluable in planning, and the cooperation from the water users of the state has led to better water management.

- **Accounting for Water Use**

Many water providers deliver a mix of water types. To determine who received what type of water for purposes of determining compliance with conservation requirements, the Department must adopt a set of policies for commingled systems. The Department is continuing to develop policies for "volumetric" accounting.

Generally, a water provider delivering different types of water through a commingled system cannot determine which type of water a customer actually received. Therefore, the provider is generally asked to account for all deliveries to its customers on a volumetric as opposed to molecular basis. This allows the provider to compute the percentage of each type of water delivered in a given year and apply that same percentage to the water delivered to each customer, regardless of the type of water actually received by the customer. This volumetric accounting policy works well for most providers, because of its simplicity and certainty. Individual circumstances may warrant individual consideration, however, and the Department is constantly reviewing its policies on volumetric accounting to recognize necessary exceptions. Generally speaking, however, the Department does not recognize accounting that purports to concentrate deliveries of certain types of water to certain users if the delivery system is physically commingled.

- **Enforcement**

An effective conservation plan requires effective enforcement. The Department is given wide ranging enforcement authority in the statutes to ensure that all water users are contributing their share to the overall goal of groundwater conservation and augmentation of water supplies. While the statutes allow the imposition of substantial monetary penalties for violating either water use limitations or conservation requirements, the Department is also given considerable discretion in how that enforcement program will be managed. Overall, the Department's philosophy has been that the ability to correct management deficiencies and save groundwater is more important than collecting monetary penalties. Therefore, most of the Department's regulatory efforts to date have involved voluntary "consent orders" where the water user accused of a violation agrees to adopt conservation measures, guarantee future compliance, or otherwise mitigate the impact of the violation on the state's groundwater resources in exchange for waiver or reduction of the civil penalties. This approach has worked well in the past, and has been particularly useful in making the transition from a state where groundwater use was essentially unregulated to a state where water regulation has become a fact of everyday life.

During the third management period, the Department will continue its policy of reviewing each suspected violation on an individual basis. The Department will also continue its policy of working with any water user accused of violating the groundwater laws to make certain that all the surrounding circumstances are understood and to explore alternative means by which the problem might be solved. In some cases, however, violations are not matters of inadvertence or misunderstanding, but are repeat offenses or voluntary decisions based on economic considerations, lack of planning, or careless disregard for the resource. During the third management period, the Department will strive to identify these latter types of violations and prosecute them vigorously by imposition of stringent civil penalties. By so doing, the Department believes it will bring a greater equity and fairness to the common goal of saving the State's groundwater supply.

The foregoing synopsis of the Department's regulatory philosophy is intended to assist the reader in understanding the reasons behind the mandatory conservation requirements in the following regulatory chapters of this Third Management Plan. In addition, a Plan Implementation Chapter, which gives more definitive explanation to many of the administrative policies and procedures, has been included. Finally, it has always been the Department's policy to offer assistance to anyone seeking to better understand or comply with the conservation requirements imposed by the management plans, or the requirements of the Code. The AMA offices or the Department's central office in Phoenix can provide valuable support on most water management issues.

CHAPTER

4

Agricultural Conservation Program

4.1 INTRODUCTION

The Agricultural Conservation Program for the Third Management Plan has been developed to contribute to the achievement of the water management goal for the Pinal Active Management Area (AMA). The goal for the AMA is to allow the development of non-irrigation water uses and to extend the life of the agricultural economy for as long as feasible, while preserving water supplies for future non-agricultural uses.

As discussed in Chapter 3, agriculture is responsible for approximately 97.5 percent of the total water use in the Pinal AMA. In 1995, a total of 844,207 acre-feet of water was used by non-Indian agriculture. Of this total, 342,752 acre-feet were pumped groundwater, 46,983 acre-feet were in-lieu groundwater, 298,671 acre-feet were Central Arizona Project (CAP) water, 151,527 acre-feet were from surface water sources, and 4,274 acre-feet were effluent.

Only land associated with a Certificate of Irrigation Grandfathered Right (IGFR) can be legally irrigated with groundwater within an AMA. A.R.S. § 45-465. These certificates were issued by the Arizona Department of Water Resources (Department) based on crops and acreage planted from the years 1975 to 1980. Land not irrigated during this time period may not be irrigated unless one of the exceptions stated in the Groundwater Code (Code) applies. A.R.S. § 45-452. For each IGFR, the Department establishes a maximum annual groundwater allotment based on certain statutory criteria.

At this time, the Department is deferring adoption of a Base Program under A.R.S. § 45-566(A)(1) as part of the Agricultural Conservation Program. This delay is based on concerns which have been raised by the agricultural community regarding the proposed adoption of an agricultural conservation program that includes water duties based upon an 85 percent irrigation efficiency.

Presently, the Department is adopting the Historic Cropping Program that was authorized by A.R.S. § 45-566.02 and conservation requirements for irrigation distribution systems. Participation in the Historic Cropping Program is voluntary, and those who do not participate will be subject to the agricultural conservation requirements established by the Second Management Plan until the Department adopts a Base Program for the Third Management Plan. Descriptions of the Historic Cropping Program and the irrigation distribution system conservation program are detailed in this chapter.

In addition to these regulatory conservation programs, the Department will continue to encourage the efficient use of renewable water supplies by the agricultural sector through other water resource management methods. During the third management period, indirect recharge at groundwater savings facilities, effluent reuse programs, and programs supported by water management assistance funds will contribute to the water management activities in the Pinal AMA.

In this chapter, the following topics are discussed in the order listed:

- Statutory Provisions (section 4.2)
- Irrigation Water Duties and Maximum Annual Groundwater Allotments (section 4.3)
- Agricultural Conservation Program Components (section 4.4)
- Non-Regulatory Water Resource Management Strategies (section 4.5)
- Future Directions (section 4.6)
- Agricultural Conservation Requirements and Monitoring and Reporting Requirements (section 4.7)

4.2 STATUTORY PROVISIONS

The Code limits uses of groundwater for irrigation purposes in AMAs in several ways. These statutory provisions are described below.

4.2.1 Third Management Plan

A.R.S. § 45-566 requires the director to follow established guidelines in developing management plans for the third management period (the years 2000 to 2010). For the agricultural sector, in the plan for each AMA, the director:

- Shall establish an irrigation water duty for each farm unit to be reached by the end of the third management period.
- May establish one or more intermediate water duties to be reached at specified intervals during the third management period.
- Shall calculate the irrigation water duty or intermediate water duties as the quantity of water reasonably required to irrigate the crops historically grown in the farm unit and shall assume the maximum conservation consistent with prudent long-term farm management practices within areas of similar farming conditions, considering the time to amortize conservation investments and financing costs.
- After computing the irrigation water duties or intermediate water duties, may adjust the highest 25 percent of the water duties within an area of similar farming conditions by reducing each water duty in an amount up to 10 percent, except that in making the adjustment, no water duty may be reduced to an amount less than the highest water duty within the lowest 75 percent of the water duties computed within an area of similar farming conditions.
- Shall grant an exemption from the irrigation water duties at any time during the third management period if an applicant can demonstrate to the director's satisfaction that the applicant's farm unit meets specific hydrologic conditions regarding waterlogging or basin outflow.
- Shall establish additional economically reasonable conservation requirements for the distribution of groundwater by cities, towns, private water companies, and irrigation districts within their service areas.

4.2.2 New Irrigated Lands Prohibited

Under A.R.S. § 45-452, only acres of land which were legally irrigated at any time from January 1, 1975 through January 1, 1980, which are capable of being irrigated and which have not been retired from irrigation or conveyed for a non-irrigation use, may be irrigated with any water unless one of the following exceptions apply:

- Surface water may be used pursuant to decreed or appropriative rights established before June 12, 1980. A.R.S. § 45-452(A).
- Existing acreage irrigated with surface water may be replaced with new acreage if the surface water right is severed and transferred to the new acreage. A.R.S. § 45-172.
- State universities may irrigate new acreage not to exceed a total of 320 acres of land with not more than five acre-feet of groundwater per acre per year. A.R.S. § 45-452(I).

- Correctional facilities under the jurisdiction of the Arizona Department of Corrections may irrigate new acreage not to exceed a total of ten acres of land with not more than 4.5 acre-feet of water per acre per year for the purpose of producing plants for consumption by inmates as part of a prisoner work program. A.R.S. § 45-452(J).

- Existing acreage damaged by floodwater may be replaced with new acreage. A.R.S. § 45-465.01.

- Existing acreage which has a condition that limits irrigation efficiency may be replaced with new acreage. A.R.S. § 45-465.02.

4.2.3 Maximum Annual Groundwater Allotments

Under A.R.S. § 45-465, the maximum annual groundwater allotment for each IGFR is determined by multiplying the irrigation water duty by the water duty acres. The irrigation water duty is the annual amount of water in acre-feet per acre that is reasonable to apply to irrigated land to produce the crops historically grown (1975 to 1980) divided by an assigned irrigation efficiency. Water duty acres are the highest number of acres in a farm, taking land rotation into account, that were legally irrigated during any one year from 1975 to 1980. The maximum annual groundwater allotment may be used to irrigate any or all of the irrigation acres in the farm unit. Irrigation acres are the acres in the farm which were legally irrigated at any time from 1975 to 1980.

4.2.4 Flexibility Account Provisions

In order to provide farmers with sufficient flexibility to address varying climatic conditions and to take advantage of changing agricultural market conditions, the Code requires the director to establish a flexibility (flex) account for each farm which receives a maximum annual groundwater allotment. A.R.S. § 45-467. In 1988, the Department began implementing these provisions in the Pinal AMA.

Under the flex account statute, a right holder may accumulate both flex account credits and debits. If a right holder uses groundwater in excess of the farm's maximum annual groundwater allotment, the flex account is debited. A negative balance which exceeds 50 percent of the annual allotment results in a violation of the conservation requirement. If a right holder uses less water than the farm's maximum annual groundwater allotment, the flex account is credited. Accrued flex account credits are not limited, can be used at any time in future years, and may be used to offset a debit. In addition, under certain conditions right holders may transfer flex account credits accumulated during the preceding calendar year from one IGFR to another. A.R.S. § 45-467(O).

4.2.5 Historic Cropping Program

In 1998 the Legislature adopted A.R.S. § 45-566.02 that directs the Department to include in the Third Management Plan an agricultural conservation program entitled the Historic Cropping Program. Laws 1998, Ch. 274, § 1. Under this program, the director must calculate the maximum annual groundwater allotment as provided in A.R.S. § 45-465 and must calculate the irrigation water duty using an irrigation efficiency of 75 percent. In areas deemed by the director to have limiting soils, the statute authorizes the director to use an irrigation efficiency as low as 70 percent. In addition, the director may not register credits to the flex account established under A.R.S. § 45-467 which cause the credit balance to exceed 75 percent of the maximum annual groundwater allotment established under the Historic Cropping Program. This program is described in more detail in section 4.4.1.

4.2.6 Small Irrigation Grandfathered Rights

In 1994, legislation was passed that deregulated small IGFRs. A small IGFR is defined as a farm with ten or fewer irrigation acres and that is not part of an integrated farming operation of more than ten acres. Under A.R.S. §§ 45-563.02 and 632(D), small IGFRs are not required to report annual water use or to comply with water duty limitations. Small IGFRs make up about one third of the total IGFRs in the Pinal AMA but account for less than 3 percent of the total water use.

4.3 IRRIGATION WATER DUTIES AND MAXIMUM ANNUAL GROUNDWATER ALLOTMENTS

The irrigation water duty is the primary component of the Historic Cropping Program and is used to determine the maximum annual groundwater allotment for each IGFR. The following sections describe how the Department determines water duties and maximum annual groundwater allotments.

4.3.1 Calculation of Irrigation Water Duties

The irrigation water duty is the quantity of water reasonably required per acre to annually irrigate the crops historically grown in a farm unit from 1975 to 1980. The crops historically grown in each farm unit were verified and established during the first management period. The Department calculates the irrigation water duty for each IGFR using the following formula:

$$\textit{Irrigation Water Duty} = \frac{\textit{Total Irrigation Requirement per Acre}}{\textit{Assigned Irrigation Efficiency}}$$

In this formula, the irrigation water duty is calculated by dividing the total water requirements to produce the crops historically grown by an assigned irrigation efficiency. Each component of the formula is discussed below.

4.3.1.1 Assigned Irrigation Efficiencies

Irrigation efficiency is a measure of the overall effectiveness of water application during a crop season. The effectiveness is a function of many variables including evaporation loss, soil intake rate, water application rates, irrigation system type, crop type, and irrigation water management practices.

The assigned irrigation efficiency establishes a benchmark value which is determined for each management period in accordance with statutory provisions. For the Historic Cropping Program, the assigned irrigation efficiency for farms with non-limiting soils is 75 percent as prescribed by A.R.S. § 45-566.02.

4.3.1.2 Total Irrigation Requirement

The total irrigation requirement for each farm unit equals the amount of water needed annually to satisfy the sum of the irrigation requirements for all of the crops historically grown. For each crop, the irrigation requirement (IR) consists of the amount of water needed to meet the consumptive use (CU) requirement of the crop, plus any other needs (ON) that the crop may have, plus any needed leaching allowance (LA), less the amount of any effective precipitation (EP). The irrigation requirement is calculated by the following equation:

$$IR = CU + ON + LA - EP$$

The components of the irrigation requirement equation are discussed below.

4.3.1.2.1 Consumptive Use

The consumptive use requirement of a crop is the amount of water used in transpiration and building of plant tissue, together with the amount of water evaporated from adjacent soil during the growing season. Crop consumptive use values are based on accepted scientific methods and commonly used values for the Pinal AMA. Based on the data currently available, Appendix 4 lists the consumptive use requirement for each crop grown.

4.3.1.2.2 Other Needs

Water required by certain crops for purposes other than consumptive use is referred to as "other needs" water. Some vegetable crops, such as lettuce, need additional water for germination, cooling, and quality control. The Department makes adjustments for those crops which have "other needs." Appendix 4 lists the "other needs" requirements for crops historically grown in the Pinal AMA.

4.3.1.2.3 Leaching Allowance

In some situations, a crop may require additional water for leaching or deep percolation. A leaching allowance may be necessary to prevent salts from accumulating in the crop root zone when high levels of total dissolved solids (TDS) are present in the irrigation water. If the accumulated salts in the soil profile are not leached below the root zone, soil salinity will increase and eventually inhibit plant growth and yields.

The procedure used to calculate the leaching allowance for a crop is shown by the following equation:

$$LA = \frac{AE}{0.85}\left[CU\left[\frac{1}{1 - \frac{EC_w}{5EC_e - EC_w}} - 1 \right] \right]$$

In this equation, LA = leaching allowance for the crop; AE = assigned irrigation efficiency for the farm unit; CU = consumptive use requirement of the crop; EC_w = electrical conductivity of the irrigation water (expressed in millimhos per centimeter); and EC_e = tolerance of the crop to soil salinity as indicated by the electrical conductivity of the soil saturation extract (expressed in millimhos per centimeter).

Most irrigation water in the Pinal AMA is of adequate quality for irrigation purposes. Consequently, the Department did not include leaching allowances in the calculation of irrigation requirements for crops grown in the AMA. If, however, a particular irrigation water supply has an EC_w value greater than 1.5 millimhos per centimeter (a concentration of approximately 1,000 milligrams per liter of TDS), the right holder may apply to the Department for an administrative review as discussed in Chapter 10.

4.3.1.2.4 Effective Precipitation

Effective precipitation is defined as the amount of precipitation occurring before and during the growing season that is available for plant growth. Because precipitation is minimal and varies considerably by year and location in the Pinal AMA, effective precipitation is difficult to quantify and is not subtracted from the total irrigation requirements for the crops historically grown. However, managing the use of precipitation to offset use of other water supplies could be an important irrigation water management tool.

4.3.2 Calculation of Maximum Annual Groundwater Allotments

The maximum annual groundwater allotment for each IGFR is determined by multiplying the irrigation water duty by the water duty acres. These calculations are governed by A.R.S. § 45-465 (see section 4.2.3).

4.4 AGRICULTURAL CONSERVATION PROGRAM COMPONENTS

The following section describes the Agricultural Conservation Program for the Third Management Plan that is being adopted at this time. This program consists of two parts: the Historic Cropping Program and the irrigation distribution system conservation requirements program. Each of these programs is described below.

4.4.1 Historic Cropping Program

The Historic Cropping Program was developed by the Department pursuant to A.R.S. § 45-566.02. As required by this statute for the Historic Cropping Program, the Department will calculate the water duty and maximum annual groundwater allotment by dividing the total irrigation requirement per acre by an assigned irrigation efficiency of 75 percent. In areas determined by the director to have limiting soils, the director may use an assigned irrigation efficiency of 70 percent for the water duty calculation. As further required by A.R.S. § 45-566.02, the use of flex account provisions will be limited.

In order to qualify for the Historic Cropping Program, the IGFR owner must satisfy the following requirements: (1) file an application with the Department, (2) reduce any debit balance in the existing flex account to an amount which does not exceed 25 percent of the existing maximum annual groundwater allotment, (3) reduce any flex account credits in the existing flex account balance to an amount which does not exceed 75 percent of the existing maximum annual groundwater allotment, and (4) provide documentation showing that an actual irrigation efficiency of 75 percent has been, or will be, achieved on the farm on a seasonal basis. Once an IGFR owner has been accepted into the Historic Cropping Program, the owner must remain in the Historic Cropping Program during the entire third management period unless there is a change in IGFR ownership.

Participants in the Historic Cropping Program will be subject to limitations on their ability to accumulate flex account credits and debits. Participants will only be allowed to accrue flex account credits up to 75 percent and flex account debits up to 25 percent of their maximum annual groundwater allotments calculated for the Historic Cropping Program. Any IGFR owner or any person entitled to use groundwater pursuant to that IGFR who uses groundwater in an amount which causes the farm's flex account to be in arrears in excess of 25 percent of the maximum annual groundwater allotment will be considered in violation of the conservation requirements. Participants in the Historic Cropping Program will not be allowed to sell or purchase flex account credits.

In addition to these flex account credit provisions, participants will also be required to comply with certain reporting requirements. Participants must provide information regarding irrigation water management practices, irrigation system type, and the acreage and type of crops grown to assist the Department in determining program effectiveness.

The Historic Cropping Program requires a high level of farm management. Specific entrance and performance criteria must be satisfied, and only owners of IGFRs may apply (see section 4.7). IGFR owners interested in participating in the Historic Cropping Program may file an application beginning January 1, 2000 on forms provided by the Department.

4.4.2 Irrigation Distribution System Conservation Program

For the third management period, the director is required to establish "additional economically reasonable conservation requirements for the distribution of groundwater by cities, towns, private water companies and irrigation districts within their service areas." A.R.S. § 45-566(A)(5). The same conservation requirements were part of the Second Management Plan. A.R.S. § 45-565(A)(5).

In the Second Management Plan, private water companies and irrigation districts which distributed 20 percent or more of their total water deliveries for irrigation use by January 1, 1990, were required to reduce their irrigation distribution system lost and unaccounted for water either by lining all their canals, or by operating their delivery systems so that the total quantity of lost and unaccounted for water is 10 percent or less of the total quantity of water withdrawn, diverted, or received during a year. These requirements become effective upon the commencement of operation or by January 1, 2000, whichever is later. A Department review of the conservation practices of the largest irrigation districts has shown that the Second Management Plan distribution system conservation requirements are being achieved by most districts.

For the Third Management Plan, the irrigation distribution system conservation requirements established by the Second Management Plan will continue to apply to irrigation districts and private water companies which, as of January 1, 2000, distribute 20 percent or more of their total water deliveries for irrigation use. These irrigation districts and private water companies will be required to reduce their irrigation distribution system lost and unaccounted for water by lining all their canals, or by operating their delivery systems so that the total quantity of lost and unaccounted for water is 10 percent or less of the total quantity of water withdrawn, diverted, or received during a year. These requirements become effective upon the commencement of operation or by January 1, 2002, whichever is later. Until this time, the Second Management Plan irrigation distribution system conservation requirements will apply.

If a private water company or irrigation district has economic circumstances which prevent timely compliance with the irrigation distribution system conservation requirements, a variance of up to five years may be requested as provided by A.R.S. § 45-574. Information submitted in support of the variance request must include a complete water loss reduction plan, prepared by a registered civil engineer, which contains:

- A complete construction design document which shows specifications for repairing or modifying the irrigation distribution system. The document must include material specifications, proposed design specifications, installation and construction specifications, and any other engineering information or specifications necessary to complete the proposed rehabilitation of the distribution system.

- A detailed list of engineering costs and the proposed investment options designed to pay for the system improvements.

- The final completion date for the rehabilitation.

- If applicable, a system operating guide to reduce lost and unaccounted for water to a minimum. This guide may be modified as the rehabilitation progresses.

The procedures for obtaining a variance are described in Chapter 10, section 10.3.1.

4.4.3 Program Summary

The Department is adopting an Agricultural Conservation Program for the Third Management Plan that consists of two parts, the Historic Cropping Program and the irrigation distribution system conservation program, each of which are designed to assist in achieving the water resource management goal for the Pinal AMA. The Historic Cropping Program is a new program which the legislature authorized in 1998 through the enactment of A.R.S. § 45-566.02. Pursuant to this legislation, the irrigation efficiency used to calculate the maximum annual groundwater allotment for non-limiting soils is set at 75 percent, and the flex account provisions of A.R.S. § 45-467 are restricted. The irrigation distribution system conservation requirements program is essentially a continuation of requirements that were established for the Second Management Plan. These requirements are designed to assure that the amount of lost and unaccounted for water from water distribution systems are kept to a minimum. Both the Historic Cropping Program and the irrigation distribution system conservation program provide important tools for achieving the water management goal for the Pinal AMA. To further the attainment of this water management goal, the Department will also adopt a Base Program pursuant to A.R.S. § 45-566(A)(1) in the future.

4.5 NON-REGULATORY WATER RESOURCE MANAGEMENT STRATEGIES

In addition to the agricultural conservation programs described above, there are other water resource management strategies which are available to achieve the water management goal for the Pinal AMA. These strategies are described below.

4.5.1 Effluent

In 1991, the Legislature amended A.R.S. § 45-467 to exclude effluent from consideration in determining the amount of any debit to be registered to a farm's flex account. Laws 1991, Ch. 112, § 3. Under this amendment, a person using groundwater on a farm pursuant to an IGFR may use an unlimited amount of effluent on the farm without any debit being registered to the farm's flex account as a result of effluent use. This amendment has created an incentive for the use of effluent.

During the Third Management Plan, the Department will study alternatives to increase the use of effluent. In the past, effluent utilization for agricultural irrigation has been limited mostly by the lack of necessary infrastructure. Other requirements, such as the wastewater reuse rules adopted by the Arizona Department of Environmental Quality, have limited the types of crops which can be irrigated solely by effluent. As effluent treatment techniques improve and more effluent becomes accessible to the agricultural sector, the Department expects that effluent use for agricultural purposes will increase.

4.5.2 Groundwater Savings Program (Indirect Recharge)

A reduction in agricultural groundwater use has occurred in the Pinal AMA as a result of indirect recharge opportunities which were first authorized by the Legislature in 1990 and later reauthorized in 1994 as the groundwater savings program. Laws 1994, Ch. 291, § 32; Laws 1990, Ch. 176, § 14. Historically, most agricultural water use in the AMA was supplied by groundwater. In the late 1980s, much of the agricultural sector in the AMA began to utilize CAP water. In the early 1990s, agriculture's use of CAP water increased significantly through incentives provided by the indirect recharge program and arrangements made initially with the Central Arizona Water Conservation District, who operates the CAP delivery system, and later with the newly established Arizona Water Banking Authority. This increased use of renewable water supplies by agriculture has led to a large decrease in groundwater use in the AMA. However, while groundwater savings arrangements have contributed significantly to the increased use of renewable water supplies, they have also resulted in the potential future use of groundwater should the two entities recover the recharged water.

4.5.3 Conservation Assistance Program

The Conservation Assistance Program has provided funds which have been used to reduce agricultural water use in the Pinal AMA. During the second management period, the Irrigation Management Service (IMS), which has been primarily funded for seven years by the Department's Conservation Assistance Program, is one such program. The IMS is a cooperative program of the Natural Resources Conservation Districts, the U.S. Natural Resources Conservation Service, the Department, and more recently the U.S. Bureau of Reclamation (USBR). The IMS provides irrigation scheduling, application rate information, and water management education to numerous farmers. Conservation assistance monies were also made available to the University of Arizona to develop a bilingual short course on irrigation techniques. Classes were held at several locations throughout the AMA and were attended by many farmers from within the AMA, as well as other AMAs.

The use of conservation assistance monies to fund programs designed to assist the agricultural sector in the conservation of groundwater resources is expected to extend into the third management period. The Department will continue to encourage programs which promote efficient agricultural water use. The Third Management Plan Water Management Assistance Program is described more fully in Chapter 9.

4.6 FUTURE DIRECTIONS

To achieve the statutory goal for the Pinal AMA, the development of non-irrigation water uses and the life of the agricultural economy will be extended for as long as feasible, while water supplies for future non-agricultural uses are preserved. The increased utilization of renewable water supplies to replace groundwater use, combined with demand reduction efforts to enhance on-farm irrigation water management practices, are key factors in meeting this water resource management goal.

During the third management period, the Department will continue to provide the agricultural sector with technical and conservation planning assistance to reduce its reliance on groundwater supplies. The Department will investigate incentives and encourage the increased use of effluent and indirect recharge options. In addition, agreements among irrigation districts in the Pinal AMA, USBR, the Gila River Indian Community, and the Tohono O'odham Nation to limit groundwater pumping by the districts in the vicinity of the two Indian reservations will be monitored for potential benefits to non-Indian agricultural operations.

The Department will continue to work cooperatively with the agricultural community to determine appropriate conservation requirements under A.R.S. § 45-566(A)(1) and to develop additional alternative agricultural conservation programs in the Pinal AMA for the third management period.

The Department will continue to support funding for water conservation practices, education, and use of renewable water supplies in order to achieve the water management goal for the Pinal AMA. These monies may be used to assist farmers with irrigation water management practices, efficient irrigation systems, and infrastructure for the conveyance of renewable water supplies to farms.

The Department will also continue to monitor crop and water use patterns during the third management period to assess agriculture's contribution to achieving the goal for the Pinal AMA, and to evaluate the impacts of Department programs on farming operations. The impacts of the agricultural market on water use trends will also be evaluated for future planning needs.

The Agricultural Conservation Program for the Third Management Plan is a step toward achieving the water management goal for the Pinal AMA. During the third management period, this program will continue to be evaluated for its effectiveness in achieving that goal.

4.7 AGRICULTURAL CONSERVATION REQUIREMENTS AND MONITORING AND REPORTING REQUIREMENTS

4-101. Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes, the following words and phrases used in sections 4-101 through 4-105 of this chapter shall have the meanings set forth below, unless the context otherwise requires:

1. *"Assigned Irrigation Efficiency" is defined as the maximum economically feasible levels of conservation within areas of similar farming conditions which each right holder is expected to achieve.*

2. *"Canal" is defined as a waterway constructed for the purpose of transporting water to a point of delivery, including main canals and lateral canals.*

3. *"Farm" is defined under A.R.S. § 45-402.*

4. *"Farm Unit" is defined under A.R.S. § 45-402.*

5. *"Flexibility Account" is an account maintained under A.R.S. § 45-467.*

6. *"Irrigation Acre" is defined under A.R.S. § 45-402.*

7. *"Irrigation Distribution System" is defined as a system of canals, flumes, pipes, or other works which are owned or operated by an irrigation district or private water company and used to deliver water for irrigation use.*

8. *"Irrigation Water Duty" is defined under A.R.S. § 45-566 which, for the Third Management Plan, is the total irrigation requirement to produce the crops historically grown divided by the assigned irrigation efficiency.*

9. *"Lost Water" is defined as water from any source, including effluent, which enters an irrigation distribution system and is lost from the system during transportation or distribution due to seepage, evaporation, leaks, breaks, phreatophyte use, or other causes.*

10. *"Maximum Annual Groundwater Allotment" is defined as the maximum amount of groundwater which may be used per year for the irrigation of each irrigation acre in the farm which is calculated pursuant to A.R.S. § 45-465.*

11. *"On-farm Seasonal Irrigation Efficiency" is defined as the total water requirements to produce a crop divided by the total quantity of water actually applied to that crop during one growing season.*

12. *"Total Quantity of Lost and Unaccounted for Water" is defined as the total quantity of water from any source, including effluent, withdrawn, diverted, or received by an irrigation district or private water company during a calendar year less the total deliveries of water from any source, including effluent, made by the irrigation district or private water company during the calendar year that are measured or estimated based on a generally accepted method of estimating water use.*

13. *"Water Duty Acres" is defined under A.R.S. § 45-461.*

4-102. Base Agricultural Conservation Program Requirements

Unless the owner of a Certificate of Irrigation Grandfathered Right (IGFR) is regulated under the Historic Cropping Program described in section 4-103, the IGFR owner and any person who is entitled to use groundwater pursuant to that IGFR shall continue to comply with the agricultural conservation requirements established by the Second Management Plan until the director adopts a Base Program for the Third Management Plan.

4-103. Historic Cropping Program

A. Application for Regulation under the Historic Cropping Program

Only an owner of an IGFR may apply to be regulated under the Historic Cropping Program. Beginning January 1, 2000, an application may be filed by an IGFR owner at any time prior to the first compliance date for the agricultural conservation requirements established in the Fourth Management Plan. An application for regulation under the Historic Cropping Program shall be on a form prescribed by the director and shall include the following information:

1. *The name, address, and phone number of the IGFR owner.*

2. *The number of the Certificate of Irrigation Grandfathered Right.*

3. *The name, address, and phone number of any person entitled to use groundwater under the IGFR.*

4. *For each of the three previous years, the number of acres and types of crops planted and the amount of water used to irrigate the planted acres.*

5. *For each of the three previous years, the type of irrigation system which has been used, including percent of slope, length of runs, and method of field application.*

6. *For each of the three previous years, a description of all water conservation practices used on the farm, including the name of any conservation program or irrigation water management service used on the farm.*

B. Criteria for Approval of Application

The director shall approve a complete and correct application for regulation under the Historic Cropping Program if the following requirements are satisfied:

1. *Any negative flexibility account balance in the farm's flexibility account does not exceed 25 percent of the maximum annual groundwater allotment in effect at the time that the application is made.*

2. *Any positive flexibility account balance in the farm's flexibility account does not exceed 75 percent of the maximum annual groundwater allotment in effect at the time that the application is made. In order to satisfy this requirement, the IGFR owner may sell or convey any excess credits as provided by A.R.S. § 45-467 or the IGFR owner may relinquish any excess credits.*

3. *The IGFR owner demonstrates that the average on-farm seasonal irrigation efficiency achieved on the farm's irrigation acres during the previous three years was 75 percent or greater. If the IGFR owner cannot demonstrate that an average on-farm seasonal irrigation efficiency of at least 75 percent has been achieved during the previous three years, the IGFR owner shall agree in writing to develop and implement at least one of the following:*

   a. *Enroll in a Department-sponsored or private irrigation management services program throughout the entire third management period or until the IGFR owner can demonstrate to the Department that an average on-farm seasonal irrigation efficiency of at least 75 percent has been achieved during the previous three years.*

   b. *Install a conservation system improvement, approved by the Department, designed to enable the IGFR owner to achieve an on-farm seasonal irrigation efficiency of at least 75 percent.*

C. *Historic Cropping Program Requirements*

An IGFR owner who has been approved for regulation under the Historic Cropping Program and any person using groundwater pursuant to that IGFR shall comply with the provisions of this section.

1. *The IGFR owner and any person entitled to use groundwater under that IGFR shall comply with the irrigation water duty and maximum annual groundwater allotment established by the director under this section, beginning with the calendar year in which the IGFR owner is accepted into the Historic Cropping Program, and continuing thereafter until the first compliance date for any substitute conservation requirement established in the Fourth Management Plan. The director shall establish the irrigation water duty and maximum annual groundwater allotment in the same manner that the director established the irrigation water duty and maximum annual groundwater allotment assigned to the IGFR in the Second Management Plan except that the director shall use an assigned irrigation efficiency of 75 percent. In areas deemed by the director to have limiting soils, the director may use an assigned irrigation efficiency as low as 70 percent.*

2. *The IGFR owner, and any person entitled to use groundwater under that IGFR, may use the maximum annual groundwater allotment assigned to the IGFR to irrigate only the irrigation acres to which the IGFR is appurtenant.*

3. *The IGFR owner and any person entitled to use groundwater under that IGFR shall not use water for irrigation purposes during a calendar year in an amount which exceeds the maximum annual groundwater allotment assigned to the right, except as provided in the flexibility account provisions of A.R.S. § 45-467, as modified in subsection D of this section, and any rules adopted by the director.*

D. *Flexibility Account Provisions*

Under the Historic Cropping Program, the flexibility account provisions of A.R.S. § 45-467 shall apply to the IGFR owner and any person entitled to use groundwater under that IGFR with the following modifications:

1. *If the amount of water used to irrigate the farm in any year is less than the maximum annual groundwater allotment established for the farm pursuant to subsection C, paragraph 1 of this section, the amount of any credit registered to the farm's flexibility account pursuant to A.R.S. § 45-467 shall not exceed the difference between the existing balance in the account and a positive account balance of 75 percent of the maximum annual groundwater allotment. The director shall not register a credit to the farm's flexibility account in any year in which the account has an existing positive account balance equal to or greater than 75 percent of the maximum annual groundwater allotment.*

2. *The IGFR owner and any person entitled to use groundwater under that IGFR who are regulated under the Historic Cropping Program shall not:*

    a. *Purchase or sell flexibility account credits to another IGFR owner or any other person entitled to use groundwater under another IGFR regardless of whether they are regulated under the Historic Cropping Program.*

    b. *Transfer credits from the flexibility account of one farm to another farm even if the farms are owned by the same IGFR owner.*

3. *The maximum excess amount of groundwater that may be used pursuant to A.R.S. § 45-467 shall not exceed 25 percent of the maximum annual groundwater allotment established for the farm pursuant to subsection C, paragraph 1 of this section. The IGFR owner and any person entitled to use groundwater under that IGFR violate this section if the flexibility account maintained for the IGFR is in arrears at any time in excess of this amount.*

E. Reporting Requirements

In addition to the information required to be submitted in the annual report required by A.R.S. § 45-632, the IGFR owner and any person entitled to use groundwater pursuant to that IGFR shall submit the following information in the report:

1. *The name, address, and phone number of any person entitled to use groundwater under the IGFR.*

2. *The number of acres and types of crops planted and the amount of water used to irrigate the planted acres.*

3. *The type of irrigation system which has been used, including percent of slope, length of runs, and method of field application.*

4. *A description of all water conservation practices used on the farm, including the name of any conservation program or irrigation water management service used on the farm.*

F. Duration of Regulation under Historic Cropping Program

1. *Except as provided in paragraph 2 of this subsection, after the director approves an application for regulation under the Historic Cropping Program, the IGFR owner and any person entitled to use groundwater pursuant to that right shall be regulated under the Historic Cropping Program until the first compliance date for any substitute agricultural conservation requirement established in the Fourth Management Plan.*

2. *After the director approves an application for regulation under the Historic Cropping Program, the IGFR owner must remain in the Historic Cropping Program during the entire third management period except that a subsequent owner of the IGFR file a written request to leave the Historic Cropping Program with the director within 90 days after acquiring an ownership interest in the IGFR. The director shall grant the request unless the director determines that the request is being made for the purpose of circumventing the provisions of paragraph 1 of this subsection, in which case the request will be denied. In the event that an IGFR is owned by more than one person, this paragraph does not apply unless all owners have conveyed their interests in the IGFR and all subsequent owners join in filing a written request with the director to leave the Historic Cropping Program.*

4-104. Conservation Requirements for Irrigation Distribution Systems

A. Applicability

The irrigation distribution system conservation requirements set forth in subsection B below apply to irrigation districts and private water companies which, as of January 1, 2000, distribute 20 percent or more of their total water deliveries for irrigation use.

B. Conservation Requirements

By January 1, 2002 or upon commencement of operation, whichever is later, and continuing thereafter until the first compliance date of any substitute requirement in the Fourth Management Plan, each irrigation district and private water company owning or operating an irrigation distribution system shall either:

1. *Line all canals used to deliver water for irrigation use with a material that allows no more lost water than a well-maintained concrete lining, or*

2. *Operate and maintain its distribution system so that the total quantity of lost and unaccounted for water is 10 percent or less of the total quantity of water from any source, including effluent, withdrawn, diverted, or received by the irrigation district or private water company on either a calendar year basis or a three-year average basis based on that calendar year and the two preceding calendar years.*

4-105. Monitoring and Reporting Requirements for Irrigation Districts and Private Water Companies

A. Applicability

The monitoring and reporting requirements set forth in subsection B below apply to irrigation districts and private water companies which, as of January 1, 2000, distribute 20 percent or more of their total water deliveries for irrigation use.

B. Monitoring and Reporting Requirements

For calendar year 2002 and for each calendar year thereafter until the compliance date for any substitute requirement in the Fourth Management Plan, each irrigation district and private water company owning or operating an irrigation distribution system shall submit in its annual report required by A.R.S. § 45-632, the following information as it applies to the irrigation district or private water company:

1. *A map showing the irrigation distribution system, including those portions which have lined canals and those portions which have unlined canals, unless a current map is on file with the Department.*

2. *The number of miles of lined canals and the number of miles of unlined canals in the irrigation distribution system.*

3. *The total quantity of water from any source, including effluent, which was withdrawn, diverted, or received by the irrigation district or private water company during the calendar year.*

4. *The total quantity of water from any source, including effluent, delivered by the irrigation district or private water company to all water users during the calendar year.*

5. *An estimate of the irrigation district's or private water company's total quantity of lost and unaccounted for water for the calendar year. This quantity shall be determined by a generally accepted engineering method.*

APPENDIX 4
CONSUMPTIVE USE AND OTHER NEEDS REQUIREMENTS BY CROP
PINAL ACTIVE MANAGEMENT AREA

Crops	Consumptive Use (acre-feet/acre)	Other Needs (acre-feet/acre)
Grain Crops		
Barley	2.08	----
Maize	2.12	----
Millet	2.58	----
Oats	1.83	----
Rye	1.83	----
Grain Sorghum (Single Crop)	2.12	----
Grain Sorghum (Double Crop)	4.29	----
Wheat	2.15	----
Corn	2.12	----
Forage Crops		
Alfalfa	4.06[1]	----
Bermuda Grass	3.63	----
Blue Panic Grass	4.36	----
Clover	4.33	----
Ensilage	2.08	----
Permanent Pasture Mix	5.67	----
Sudan Grass/Sudex	2.58	----
Field Crops		
Castor Beans	3.70	----
Cotton	3.43	----
Cotton (Dry Plant)	3.43	0.33
Flax	2.60	----
Pinto Beans	1.25	----
Safflower	3.78	----
Soybeans	1.85	----
Sugar Beets	3.56	----
Plantago	1.25	----
Guar	1.93	----
Vegetable Crops		
Table Beets	2.00	0.50

APPENDIX 4
CONSUMPTIVE USE AND OTHER NEEDS REQUIREMENTS BY CROP
PINAL ACTIVE MANAGEMENT AREA

Crops	Consumptive Use (acre-feet/acre)	Other Needs (acre-feet/acre)
Broccoli	1.64	0.50
Cabbage, Early	1.43	0.50
Cabbage, Late	2.04	0.50
Carrots	1.38	0.75
Cauliflower	1.55	0.50
Chili Peppers	2.50	0.50
Sweet Corn	1.63	0.87
Cucumbers, All	1.50	0.50
Lettuce, All	0.71	2.44
Okra	2.50	0.50
Dry Onions	1.94	0.75
Green Onions	1.46	0.75
Parsnips	2.00	0.50
Potatoes	2.03	0.75
Radishes	0.75	0.50
Rappini	2.75	0.50
Turnips/Rutabagas	1.50	0.50
Tomatoes, All	2.00	0.50
Mixed Vegetables	2.00	0.50
Summer Squash/Zucchini	1.75	0.50
Green Manure Crops		
Papago Peas	1.63	----
Sesbania	1.09	----
Small Grains	1.00	----
Vine Crops		
Cantaloupe, Early	1.71	0.50
Cantaloupe, Late	1.40	0.50
Honeydew Melons	2.00	0.50
Watermelons	1.75	0.50
Citrus		
Grapefruit	3.99	----

APPENDIX 4
CONSUMPTIVE USE AND OTHER NEEDS REQUIREMENTS BY CROP
PINAL ACTIVE MANAGEMENT AREA

Crops	Consumptive Use (acre-feet/acre)	Other Needs (acre-feet/acre)
Lemons/Limes	3.99	----
Oranges, All	3.26	----
Tangerines	3.26	----
Fruits		
Dates	4.92	----
Grapes, All	3.00	0.50
Apricots	4.17	----
Nectarines	4.17	----
Peaches	4.17	----
Plums	4.17	----
Olives	2.58	----
Nuts		
Pecans (with ground cover)	5.83	----
Pecans (without ground cover)	4.50	----
Pistachios	4.33	----
Miscellaneous Crops		
Aloe Vera	1.50	----
Guayule	3.00	----
Jojoba	3.00	----
Christmas Trees	2.50	----
Cut Flowers	3.33	----
Roses	2.50	----
Nursery Stock	3.00	----
Salt Bush	1.50	----
Nursery Cactus	1.25	----

[1] Based on the average yield of alfalfa in Pinal County for the highest year in the historic period 1975 to 1980 and the determined consumptive use rate of 7.5 acre-inches per acre per ton of yield. The average yield was 6.5 tons per acre. For farm units with demonstrated historic yields above this average, the Department assigned higher consumptive use requirements up to the full consumptive use requirement of 6.19 acre-feet per acre.

Sources: Consumptive Use of Water by Major Crops in the Southwestern United States, Conservation Research Report #29, United States Department of Agriculture, Agricultural Research Service. (Provides consumptive use values for major crops in southwestern United States.)

FAO Irrigation and Drainage Paper #24, Food and Agriculture Organization of the United Nations (revised 1977). (Describes Blaney-Criddle method for computing consumptive use values.)